

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 15 NOV 2005

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Applicant's or agent's file reference RSJ07981WO	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA416
International application No. PCT/GB2004/004542	International filing date (day/month/year) 27.10.2004	Priority date (day/month/year) 13.11.2003	
International Patent Classification (IPC) or national classification and IPC H01J37/32			
Applicant OXFORD INSTRUMENTS PLASMA TECHNOLOGY LTD. et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  10.06.2005		Date of completion of this report  11.11.2005	
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Hoyer, W  Telephone No. +49 89 2399-8439	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/004542

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-14 as originally filed

**Claims, Numbers**

1-23 as originally filed

**Drawings, Sheets**

1/2-2/2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/004542

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1 - 23
	No: Claims	
Inventive step (IS)	Yes: Claims	1 - 23
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1 - 23
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**Re Item V.**

1. The following document is referred to in this communication:

D1: US-A-5 542 559 (ARAMI JUNICHI ET AL) 6 August 1996 (1996-08-06)  
D2: US-A-3 520 110 (KNAUER WOLFGANG) 14 July 1970 (1970-07-14)  
D3: EP-A-1 008 674 (TOKYO ELECTRON LTD) 14 June 2000 (2000-06-14)  
D4: PATENT ABSTRACTS OF JAPAN vol. 0102, no. 36 (E-428), 15 August 1986  
(1986-08-15) & JP 61 067922 A (FUJITSU LTD), 8 April 1986

2. D1 is considered as closest prior art. D1 discloses a plasma treatment apparatus comprising a gas port assembly. According to the description (for references, see International Search Report) the assembly comprises a gas supply conduit 5 which has at its portion located within an electrically insulating member 4 a first flowpath member 6, a second flowpath member 7, and a third flowpath member 8 fitted therinto. The three flowpath members are each of a length of 10 mm or less and provided with a multiplicity of flow paths having small diameters. The flowpath members 6 to 8 and combinations thereof will be described in detail with reference to Figures 2 to 4. The first and second flowpath members 6 and 7 are each made of a cylinder of an electrically insulating material, for example, Teflon® (brand name of E. I. Du Pont de Nemours & Co. Inc. for PTFE) and having at its one end a recess 61, 71 with a diameter slightly smaller than its outer diameter and a depth of the order of, for example, 1 mm. From the bottom of the recess 61, 71 to the other end extend axially a multiplicity of conduction holes 62, 72 having a small diameter of, for example, 1 mm or less.

- 2.1 The conduction holes 62 and 72 may be arranged along, for example, a plurality of circles concentric with the outer diameter of the flowpath members 6 and 7. The third flowpath member 8 is made of a cylinder of an electrically conducting material, for example, aluminum and having at its one end a recess 81 similar to the recess 61, 71. From the bottom of the recess 81 to the opposite end extends axially a conduction hole 82, for example, having the same diameter as the bore diameter of the gas supply conduit 5 located outside the vacuum treatment chamber 2.

- 2.2 Within the gas supply conduit 5 are inserted first flowpath members 6 and second flowpath members 7 alternately from the underside of the lower electrode 3 (the support 32) with their respective recesses 61, 71 facing upward. Further, a plurality of third flowpath members 8 are disposed in series below the vicinity of the interface between the electrically insulating member 4 and the grounded member 41, with their recesses 81 facing upward so as to be continuous with the arrangement of the flowpath members 6 and 7 and in close contact with the lowermost flowpath member 6 or 7. In this embodiment, the gas supply conduit 5 and the flowpath members 6 to 8 constitute backside gas (He) flowpath means. Each flowpath member (6 or 7) was approximately 6 mm in length, and the conduction hole had a diameter of the order of 0.8 mm. As can be seen from the results of Figure 9, the electrical discharge start voltage becomes higher as the number of the flowpath members increases. For example, the discharge start voltage is higher than 1 kV at a pressure of 1.3 kPa (10 Torr). It will thus be understood that with two or more flowpath members the electrical discharge could be securely prevented even when the apparatus is set at 1 kV.
- 2.3 The apparatus of D1 can be operated with high frequency voltage which includes RF at 13.56 MHz. Moreover, it is considered that the apparatus can be operated somewhere in the broad range of 20 W - 5 kW, and that the flow rates can be adjusted to somewhere in the broad range of 10 - 5000 sccm. Aluminum is considered as a "corrosion resistant alloy".
- 2.4 D1 does not disclose a stack of gas passage members with alternating dielectric and conductive members. Consequently, the subject-matter of claims 1, 22 and 23 is novel over D1.
3. These features are also not disclosed or implied by the other documents cited in the International Search Report. D2 is not concerned with plasma processing apparatuses. D3 and D4 refer to gas supplies which completely electrically insulated.
4. The subject-matter of claims 1, 22 and 23 contributes to the art in that the alternating conductive and dielectric members act as capacity dividers to reduce high voltages within the assembly. An inventive step can be recognized. The same applies to the dependent claims 1 - 21. Thus, the criteria of Art. 33(2) and (3) PCT are met.